FIRST RECORD OF *ECHINOCHLOA STAGNINA* (POACEAE) FOR PUERTO RICO AND KEY TO THE *ECHINOCHLOA* IN THE WEST INDIES

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Echinochloa stagnina (Retz.) Beauv. (Fig. 1), commonly called "hippo grass," "Burgu grass," or "long-awned water grass" (Wells et al. 1986) is native to tropical and subtropical Africa, including Madagascar. It has become naturalized in India, Vietnam, Thailand, the Philippines, and Indonesia (Michael 1983). It is a robust,

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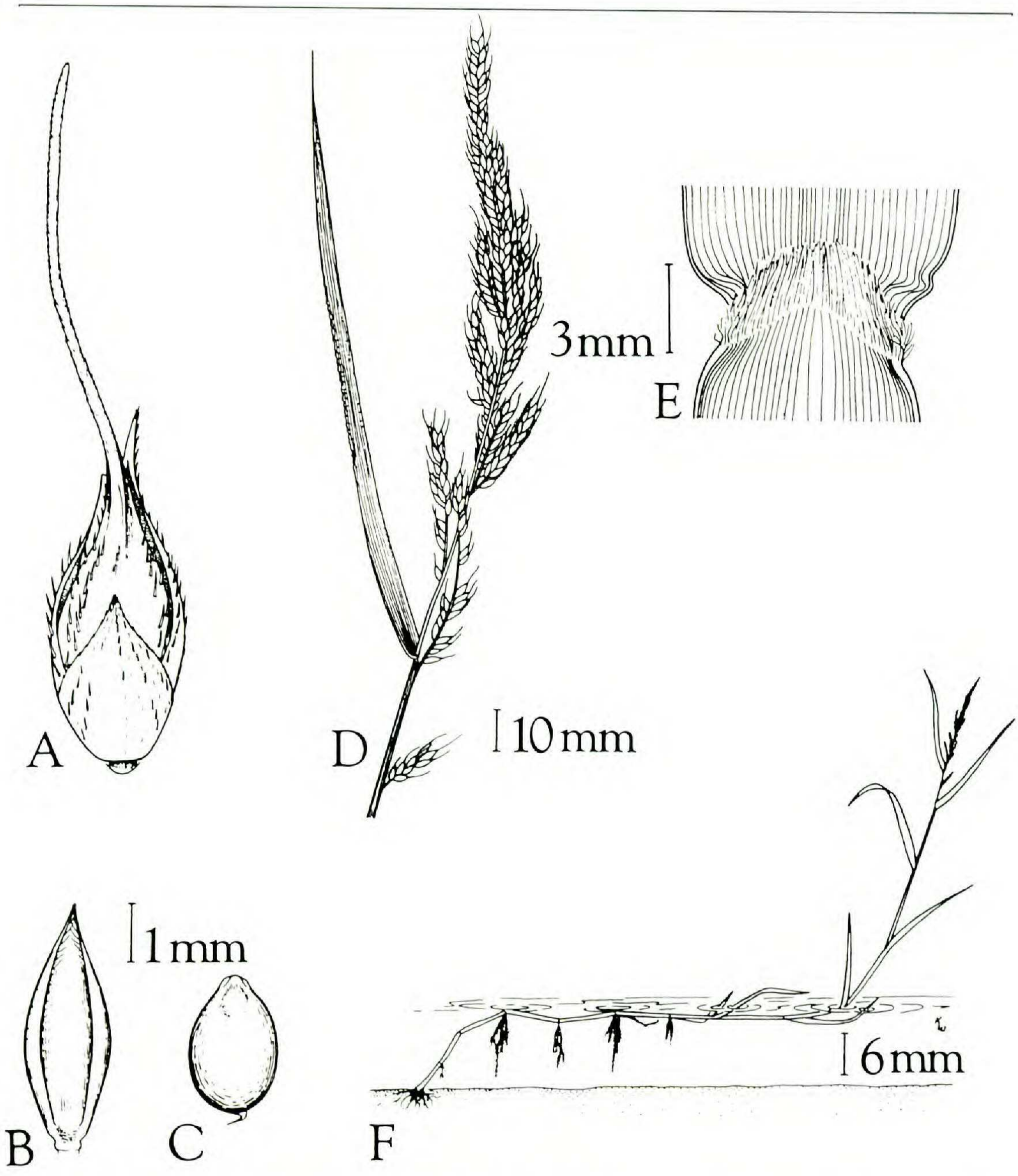

FIG. 1. *Echinochloa stagnina* (Retz.) Beauv.: A. Spikelet; B. Fertile floret; C. Caryopsis; D. Inflorescence; E. Ligule; F. Habit. Drawn from *Proctor 46386*.

usually perennial grass that reaches 1–2 meters in height and typically grows in the "mud of swamps, lakes, and rivers" (Stapf 1934). *Echinochloa stagnina* commonly floats on the water's surface and along with *E. pyramidalis* Hitchc. & Chase, is a major constituent of the large water meadows and floating islands on the Niger and Nile Rivers and Lake Chad in Africa (Chevalier 1901, Stapf 1934, Lazarides 1980). Because of its high sugar content, it is regarded as an excellent

forage grass in tropical Africa (Stapf 1934, Bor 1960, Degener and Degener 1960).

Echinochloa stagnina has been illustrated in Chevalier (1901) under the name, *Panicum burgu* A. Chev. and in Harker and Napper (1960: pl. 37) and Soerjani et al. (1987). It is an important weed of floating (deep-water) rice in tropical Africa, the Indian sub-continent and in Thailand (Yabuno 1966, Michael 1983). Due to its aggressive nature, it is considered as a problematic weed in several countries in southern Africa (Wells et al. 1986).

On 5 May 1987, the senior author collected this plant along an irrigation canal in southwestern Puerto Rico [Municipio: de Lajas, Barrio: Sabana Yeguas; ca. 0.4 km E of Rt. 116, and ca. 1.2 km due NE of Finca Juanita, elevation ca. 8–9 m, *McKenzie 704* (LSU, SJ, NSW)]. As in other localities where the species is native, many of the culms of *E. stagnina* at the Puerto Rican discovery site are submerged-aquatic, or floating on the water's surface (Fig. 1). Because inflorescences collected 5 May were immature, Proctor returned to the site on 18 May 1990, and collected specimens with mature spikelets [*Proctor 46386* (LSU, SJ, NSW)].

The population of *E. stagnina* in Puerto Rico consists of several hundreds of plants and observations of 5 May 1987 and 18 May 1990 suggest that the species is spreading. The introduction of hippo grass into Puerto Rico appears to be unintentional. It may have been accidentally introduced via rice seed or the seeds of forage grasses introduced to the island fromtropical Asia or tropical Africa.

This record constitutes the first record for Puerto Rico and possibly the West Indies. Michael examined a specimen (*Duss 3920*, F) from Guadeloupe, a duplicate of which Wiegand (1921) had named *E. guadeloupensis* (Hackel) Wieg., and concluded that it was referable to either *E. stagnina* or to the Asian species *E. picta* (Koen.) Michael, with which *E. stagnina* has often been confused (Matthew 1982, 1983). Because the spikelets of Duss's specimen are too immature for positive identification, we consider our record of *E. stagnina* as the first documented occurrence of this grass in the Caribbean.

Another specimen, *Duss 3176*, also from Guadeloupe, on which Hackel's name *Panicum spectabile* Nees var. *guadeloupense* was based is, however, as Hitchcock (1936:325–326) recognized, *E. pyramidalis*. Michael (1978) presented distinguishing criteria for *E. stagnina* and *E. picta* which Lazarides (1980) accepted in his treatment of the grasses of tropical Southeast Asia. *Echinochloa picta* has been illustrated under the name *E. stagnina* in both Degener and Degener (1960) and Reed (1977). *Echinochloa picta* has not been positively recorded for the Caribbean. It is however, likely to occur, as it has been collected in rice fields in Guyana (British Guiana).

Echinochloa stagnina resembles *E. polystachya* (H.B.K.) Hitchc. and *E. pyramidalis* of the West Indies in its robust, perennial habit, in the nature of its long trailing culms that often float on the water's surface, and in its ciliate ligules on

the lower leaf blades. *Echinochloa stagnina* can be distinguished from *E. polystachya* and *E. picta*, which also have ciliate ligules, by its more elliptical or lanceolate spikelets, and from *E. pyramidalis* by its long awned spikelets.

The accompanying key is comprised of the following species of *Echinochloa* known from or expected to occur in the West Indies: *E. colona* (L.) Link of tropical origin; *E. crus-galli* (L.) Beauv. of Eurasia; *E. glabrescens* Munro ex Hook. f., *E. oryzoides* (Ard.) Fritsch, and *E. picta* from Asia; *E. haploclada* (Stapf) Stapf, *E. pyramidalis*, and *E. stagnina* from Africa; *E. microstachya* (Wieg.) Rydb. (syn. *E. muricata* (Beauv.) Fern. var. *microstachya* Wieg.), *E. paludigena* Wieg., and *E. walteri* (Pursh) Heller from North America; *E. crus-pavonis* (H.B.K.) Schult. and *E. polystachya* from South America.

KEY TO THE SPECIES OF *ECHINOCHLOA* IN THE WEST INDIES

1a. Plants perennial
- 2a. Spikelets 2.0–3.0 mm long, with short awns; ligular cilia absent; plants close-tufted to 2.5 m tall ..... *E. haploclada*
- 2b. Spikelets longer than 3.0 mm; ligular cilia present, especially on lower leaves; plants with long creeping rhizomes or stolons.
  - 3a. Spikelets awnless or with short awns or long cusps up to 2.0 mm long, finely pubescent, or nearly glabrous; plants to 4.0 m tall with stout culms ..... *E. pyramidalis*
  - 3b. Spikelets with conspicuous bristles and awned, awns to 30.0 mm long.
    - 4a. Spikelets elliptical or lanceolate, up to 5.0 mm long, with awns to 18.0 mm long; plants floating in water with long trailing culms but rooted at bottom ..... *E. stagnina*
    - 4b. Spikelets obovate, broadly ovate, or ovate, with awns to 30.0 mm long.
      - 5a. Spikelets obovate, usually more than 5.0 mm long, awns 3.0–30.0 mm long; culms to 3.0 m tall; grass commonly found in flooded areas, swamps and ditches ..... *E. polystachya*
      - 5b. Spikelets broad-ovate or ovate, 3.0–4.0 mm long, with awns to 8.0 mm long; culms generally less than 1.0 m tall; grass commonly found in rice fields ..... *E. picta*

1b. Plants annual
- 6a. Lemma of fertile floret acute or acuminate with a stiff tip; inflorescence erect ..... *E. microstachya*
- 6b. Lemma of fertile floret with withering tip sharply differentiated from the body of the lemma; inflorescence erect or nodding.
  - 7a. Plants densely-tufted with crowded, erect tillers; plants resembling rice in habit; plants confined to rice fields.
    - 8a. Spikelets 3.0–3.5 mm long, usually awnless; lower lemma convex, indurate and shiny; inflorescence erect at maturity ..... *E. glabrescens*
    - 8b. Spikelets 3.5–5.0 mm long, nearly always awned, awns to 50.0 mm long; lemma of lower floret flat and scabrous; inflorescence hanging horizontally at maturity ..... *E. oryzoides*
  - 7b. Plants generally spreading, not resembling rice in habit; plants not confined to rice fields, but distributed over a wide range of wetland or irrigated habitats.

9a. Spikelets 3.0 mm or less long, broadly ovate to ovate, awnless, regularly arranged on branches of inflorescences; inflorescence erect ..... *E. colona*

9b. Spikelets 3.0 mm or more long, awned.

10a. Spikelets with staminate lower florets, anthers generally more than 1.2 mm long; inflorescence with widely spaced, more or less erect branches, branches with only a few long bristles ..... *E. paludigena*

10b. Spikelets lacking stamens in lower florets, anthers in fertile florets to 1.0 mm long; inflorescence with variably spaced, more or less spreading branches, branches with many to several long bristles.

11a. Inflorescences strongly drooping at maturity, as much as 180 degrees; spikelet awns obviously curved, never more than 15.0 mm long, usually much shorter ..... *E. crus-pavonis*

11b. Inflorescences often nodding but not strongly drooping at maturity; awns slightly curved or straight, of variable length, up to 60.0 mm long.

12a. Spikelets elliptical, to 5.0 mm long, with prominent spreading bristles; spikelets usually with abundant, long awns, awns 10.0–25.0 (–60.0) mm long; leaf sheaths hispid or ciliate with prominent papilla-based hairs or papillose only ..... *E. walteri*

12b. Spikelets broadly ovate to ovate, 3.0–4.0 mm long, awns 3.0–50.0 mm long, (abundant or scattered throughout the whole inflorescence, or sometimes confined to spikelets at the ends of the inflorescence branches); leaf sheaths usually glabrous ..... *E. crus–galli*

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